

CLAIMS:

The invention claimed is:

1. An article including a coupler comprising a core region disposed between two cladding regions, in which the core region receives light from at least one first device and
5 outputs light to at least one second device, the core region having a grating formed in two-dimensions so that light is output from the coupler in at least one discrete direction.
2. The article of claim 1 in which the at least one first device is selected from a distributed feedback laser and a distributed Bragg reflector laser.
- 10 3. The article of claim 2 in which the coupler is integrated on the same waveguide as the at least one first device.
4. The article of claim 1 in which one of the two cladding regions comprises air.
- 15 5. The article of claim 1 in which one of the two cladding regions comprises SiO₂.
6. The article of claim 1 in which the core region comprises an organic material.

7. The article of claim 6 in which the core region comprises 8-hydroxyquinoline aluminum doped with a laser dye.

8. The article of claim 1 in which the two-dimensional grating comprises a square or
5 a triangular latticed grating.

9. The article of claim 8 comprising the coupler ensconced within at least two distributed Bragg reflector mirrors.

10. The article of claim 1 in which the at least one first device comprises a plurality of
10 lasers.

11. The article of claim 10 in which the coupler is integrated on the same substrate as the plurality of lasers for emitting light to the coupler along a plurality of directions.

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12. The article of claim 1 in which the coupler is ensconced between two distributed Bragg reflector lasers.

13. The article of claim 1 in which the coupler is a two-dimensional photonic crystal ensconced between a plurality of one-dimensional photonic crystal layers functioning as mirrors to define a resonant cavity coupler.

5 14. The article of claim 1 in which the first device comprises a vertical cavity surface emitting laser.

15. The article of claim 1 in which the second device comprises a planar waveguide.

10 16. The article of claim 1 in which the at least one first device is selected from lasers fabricated with InP, GaN, InGaN, AlGaIn, InGaAs, InGaAsP, GaAs, and AlGaAs.

17. The article of claim 1 in which the first device comprises a quantum cascade laser.

15 18. An optical communications system comprising the article of claim 1.

19. An article comprising a two-dimensional photonic crystal coupler integrated with at least one one-dimensional photonic crystal laser wherein the gratings of the one-dimensional photonic crystal laser function as mirrors to define a resonant cavity coupler.

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20. A method of making a two-dimensional photonic crystal coupler integrated with a one-dimensional laser comprising

coating a silicon substrate with a layer of SiO_2 ;

applying a first layer of photoresist on the SiO_2 layer;

5 patterning the first layer of photoresist to define a two-dimensional latticed pattern adjacent at least one one-dimensional linear pattern;

etching the exposed areas of the structure not covered by the first layer of photoresist to define a two-dimensional grating region adjacent a one-dimensional grating region;

10 removing the first layer of photoresist;

covering the one and two-dimensional grating regions with a second layer of photoresist to define second exposed areas of the structure beyond the grating regions;

etching the second exposed areas of the structure;

removing the second layer of photoresist; and

15 applying a layer of organic material over the structure.